Physico-Mechanical Properties of the Eutectic Alloys Based on Titanium with Boride Reinforcement

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The contribution of structural constituents to the physico-mechanical properties as well as alloying influence with *p*- and *d*-elements on the latter, are considered for the eutectic alloys (Ti) + (TiB).

The alloys were prepared by are melting (cooling rate 100°C/sec). The strength characteristics were estimated from Vickers hardness measurements (at the 9.8 N load) from RT up to 800°C. The Young modulus and yield stress determined by bend testing at RT.

The comparison of curves of temperature dependence of the eutectic alloy $Ti_{84}Al_{8.5}B_{7.5}$, $(Ti_{0.9}Al_{0.1})$ + ~10 vol.% TiB, with relevant binary alloys $Ti_{90}Al_{10}$ and $Ti_{92.5}B_{7.5}$ makes clear that both structural constituents (matrix and boride reinforcement) contributes to hot hardness. One can see that the temperature of softening ("strength break-down" temperature) of the eutectic alloy is effected by the "strength break-down" temperature of matrix. The boride reinforcement contributes well to hot hardness, with not changing the "strength break-down" temperature.

The alloying with V or Nb exhibits more complex character owing to β-stabilization of matrix.

The alloying with Al and other *p*-element (Si, Ge, and Sn), which are fully dissolved only in matrix, leads to noticeable growth of hardness in the whole temperature interval under investigation, as well as it increases the "strength break-down" temperature by 100-200°C, it dependence from nature of alloying element and its content in the alloy matrix.

In multicomponent alloys each of alloying elements contributes to hot hardness although the contributions of boride reinforcing and every alloying element are mainly less than those in the ternary or quaternary alloys.

It is shown that the boride reinforcement has a number of advantages (comparing with silicide-containing materials, for example):

- the boron content in matrix on the level of its solubility does not cause the matrix brittleness;
- the Young modulus of the eutectic alloys with boride reinforcement is significantly higher than that for the alloys corresponding to matrix composition.

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